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Author(s): Russell W. Pittman

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RAILROADS AND COMPETITION: THE SANTA FE/ SOUTHERN PACIFIC MERGER PROPOSAL*

RUSSELL W. PITTMAN

The Merger Guidelines of the US Department of Justice provide the framework for a detailed analysis of the competitive implications of the proposed merger of the Santa Fe and Southern Pacific railroads. Although the gross welfare loss from the merger is found to be large—in the range of \$40–230 million per year—the transfers from shippers to the railroads are much larger. Thus an overall welfare calculus requires not only an accurate estimate of the efficiencies resulting from the merger but also a judgment as to the welfare relevance of wealth transfers.

“In the case of railways ... no one can desire to see the enormous waste of capital and land (not to speak of increased nuisance) involved in the construction of a second railway to connect the same places already united by an existing one....”

John Stuart Mill [1848, vol. 2, p. 142]

“One of the most interesting and difficult applications of the theory of monopolies is to the question whether the public interest is best served by the allotment of a distinct basin to each great railway, and excluding competition there. ... It must be admitted that, other things being equal, the ‘monopoly revenue price’ fixed by a railway will be lowered by every increase in the demand for its services. ... But, human nature being what it is, experience has shown that the breaking of a monopoly by the opening out of a competing line accelerates, rather than retards the discovery by the older line that it can afford to carry traffic at lower rates.”

Alfred Marshall [1920, V, XIV, 5]

I. INTRODUCTION

IN SEPTEMBER of 1983, the Santa Fe (ATSF) and Southern Pacific (SP) railroads announced their long-rumored, long-negotiated plan to merge. The proposed merger would have created a third large railroad in the western United States and would have followed close on the heels of the mergers

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which created the other two: the 1980 consolidation of the Burlington Northern (BN) system with the acquisition of the St. Louis–San Francisco Railway, and the 1983 acquisition by the Union Pacific (UP) system of the Western Pacific and Missouri Pacific railroads.

However, unlike the BN and UP mergers, which combined railroads with primarily connecting, or “end-to-end”, relationships, the merger of the ATSF and SP would have been primarily a parallel combination: the two roads provide the only rail service along the “southern corridor” between southern California, through Arizona and New Mexico, to Texas and the Gulf ports, and they are two of only three rail carriers between California and the Midwest.

For this reason, the Antitrust Division of the Justice Department announced in October of 1985 its opposition to the merger. Although approval of railroad merger applications by the Interstate Commerce Commission (ICC) had in recent years been “nearly automatic” (Lee, *et al.* [1987]), in July of 1986 the Commission stunned the railroad industry by turning down the merger application on a four-to-one vote. A proposal to reopen the proceeding lost by the same vote in July of 1987.

What made this proposed merger so anticompetitive that the ICC was forced to deny it? In this paper, I use the framework provided by the US Department of Justice Merger Guidelines [1984] and more recent data than were available at the time of the ICC proceeding to analyze the competitive implications of the ATSF/SP merger. I find that a serious loss of competition would likely have followed from the merger (a result also found by Shepherd [1988]), resulting in large gross deadweight losses and much larger transfers from shippers to the merging railroads. Under six of eight sets of parameters used, the efficiencies resulting from the merger outweigh the gross deadweight losses; however, under six of eight sets of parameters the transfers far outweigh the efficiencies, and under all eight sets the sum of the gross deadweight losses and the transfers outweighs the efficiencies. Thus a welfare evaluation of the merger requires a judgment as to the appropriate weight to be given to wealth transferring activities (including a prediction as to their efficiency implications).

II. THE COMPETITIVE FRAMEWORK: DEFINING MARKETS¹

A merger is anticompetitive if it results in a significant increase in market power. But what is a market? What firms are in a market? And how is power in a market to be measured?

¹This and the following section of the paper are based upon my testimony in a more recent railroad-merger proceeding: the proposed purchase by the UP of the Missouri-Kansas-Texas railroad (Pittman [1987]).

The Department of Justice Merger Guidelines define a market as

a product or group of products and a geographic area in which it is sold such that a hypothetical, profit-maximizing firm ... that was the only present and future seller of those products in that area would impose a “small but significant and nontransitory” increase in price above prevailing or likely future levels.²

The most important determinant of whether a particular product and location constitute a market is the ease with which customers currently in the proposed market may switch their purchases to other products or other locations. If consumers can switch with little difficulty, then a hypothetical monopolist would not raise price, and the product/location combination does not constitute a market.

In applying this definition, one begins with each product produced by each merging firm and asks whether a hypothetical single seller of this product would have the ability to impose successfully a “small but significant and nontransitory” increase in price above the prevailing level. If such a price increase seems likely to be sustainable, then this product constitutes a market. If such a price increase seems unlikely to be sustainable because of the movement of buyers to other products, then we add the next-best substitute product to the product group and ask the price-increase question again. Progressively less close substitutes are added until the question is answered in the affirmative, at which point the product or group of products is accepted for analysis as a market.

In the analysis of a merger proposal by two railroads with largely parallel routes, the logical starting point for defining a market is the carriage of a particular commodity (call it X) from one point (call it origin A) to a second point (call it destination B) by the merging railroads.³ In some instances, the merging railroads may be the only firms in that market. In other instances, there are additional railroad carriers capable of carrying the same commodity X between the same two points A and B at price and service terms comparable to those offered by the merging railroads, and these must be included in the market as well.

Further, in at least two situations the product group must be expanded beyond the carriage by rail of X from A to B . These situations are the following:

- (1) “intermodal competition”: when nonrail transportation modes can economically carry X from A to B ; and
- (2) “source competition”: when rail or nonrail transportation modes can

² Department of Justice Merger Guidelines at 2.0.

³ If the merger proposal under consideration concerns two railroads with purely an end-to-end relationship, then no such markets would be served by both firms. This does not mean that no loss of competition is possible from such a merger, however. This is because markets may also consist of the carriage of commodity X from and/or to common point A by the merging railroads.

economically carry X from A (to anywhere else) and rail or nonrail modes can economically carry X to B (from anywhere else).⁴

Intermodal competition refers to the ability of shippers to substitute another mode of transportation for rail in the shipment of X from A to B . The alternative mode in question is usually motor carrier and is almost always either motor carrier or water carrier. (For certain products it may be an oil, gas, or coal-slurry pipeline.) Motor carriers offer important service advantages over rail carriers, and in many cases they are close substitutes for rail transportation. However, there are certain commodities and certain conditions for which motor carriers are at a significant disadvantage relative to rail and so may not be in the market—most importantly, when the distance between A and B is great, when the volume of X shipments is large, and when the value of X relative to its weight is small.⁵ Water transportation is sometimes a better substitute for rail than is motor transportation, especially for bulk products travelling long distances, but its substitutability is obviously limited to only certain geographic locations.⁶

If trucks or barges are close substitutes for rail in the hauling of a particular commodity, then trucks or barges must be included in the market with rail, and the cost and entry conditions relevant to trucks or barges must be considered in the analysis of the degree of market power possessed by rail carriers following a merger.

Source competition refers to the ability of shippers faced with super-competitive rail prices in the shipment of X from A to respond by sending their commodity to alternative destination C , and the corresponding ability of customers at B to buy their commodity from alternative origin D . Source competition is a very good competitive alternative for some shippers and customers, but it is a very poor one for others. As Richard Levin testified in the ATSF/SP merger deliberations, source competition

tends to be effective when sources of supply are numerous, when cost conditions of alternative sources of supply are homogeneous, when transport costs from alternative sources are similar, when the delivered products are close substitutes, and when the share of transport costs in the delivered price of the product is high.⁷

⁴ A third situation of potential importance is called “product competition”: when other carriers, using whatever mode, can economically carry a different commodity Y to B , where Y is a close substitute for X . I did not find this an important consideration in evaluating this merger, so I do not discuss it further here.

⁵ See, for example, Oum [1979]; Friedlaender and Spady [1981]; Levin [1981]; and Winston [1985].

⁶ See, for example, Kneafsey [1975, pp. 63–64]; Liba [1982]; and Hauser and Grove [1986].

⁷ Levin [1984, p. 5]. The first, third, and fourth of these factors probably require no explanation. Cost conditions are important for the following reason. Suppose that two origins, S and T , currently supply a destination at the same price level, but that T is operating much closer to its capacity constraint—i.e. it is on or near a steeper portion of its supply curve. Then an attempt by carriers (or shippers) at S to raise price could not be undermined by output expansion

Source competition tends not to be effective in constraining market power for the carriage of commodities that are strongly differentiated by brand name, because maintenance of the goodwill stock of the brand name may require service to particular locations. A railroad facing no competition on a particular origin-destination pair can take advantage of this requirement and expropriate the available quasi-rents.

If the commodity in question is one for which source competition may in principle be effective, one must examine the possibility of this competition at both the origin and the destination of the origin-destination move being analyzed. Only if there is effective source competition at both the origin and the destination can such competition generally mitigate effectively the market power of carriers serving the origin-destination pair.

The reasoning is as follows. An origin-destination monopolist is really a monopolist *intermediary* between the seller at the origin and the customer at the destination. If only the seller or only the customer has competitive alternatives, then the other remains at the mercy of the monopolist. A monopoly railroad at the destination can raise the delivered price paid by the customer, forcing it to climb up its demand curve to a less desirable point; correspondingly, a monopsony railroad at the origin can lower the effective price received by the seller, forcing it to climb down its supply curve to a less desirable point. As long as the relevant demand and supply curves are less than perfectly elastic, there is both a wealth transfer to the railroad and a deadweight welfare loss to society.⁸

III. THE COMPETITIVE FRAMEWORK: MEASURING MARKET POWER

Once one is satisfied that a product-location pair constitutes a market, what factors dictate whether a merger of two firms in the market would create or enhance market power?

Let us define market power as “the ability of one or more firms profitably to maintain prices above competitive levels for a significant period of time.”⁹ If the only two firms in a market merge to form a monopoly, they would possess such power by definition, since that is precisely the criterion by which

at T , and source competition would be ineffective. The share of transport cost in the value of the delivered commodity is important because the higher this share, the more sensitive purchasers will be to an increase in the cost and the more likely they will be to switch to other sources (a point made originally by Marshall [1920, V, VI, 2] and qualified by Hicks [1932, p. 242]. For a recent discussion of the continuing controversy, see Peirson [1988]).

⁸ For an early discussion, see Clark [1910]. As Warren-Boulton [1978, p. 52] points out, such a monopoly may in fact yield no welfare loss if the buyer(s) and seller(s) are able to agree on the profit-maximizing quantity and restrict the dimension of their bargaining to price. This outcome is easiest to imagine in a bilateral monopoly configuration, but it could occur when a monopoly faces a small number of buyers or a monopsony faces a small number of sellers.

⁹ Department of Justice Merger Guidelines at 1.0.

we have defined a market in the first place. If two of a small number of firms in a market merge to form an even smaller number, their ability to achieve supercompetitive pricing would likely be enhanced significantly, assuming that entry by other firms into the market is not easy.¹⁰

If a particular location/commodity pair market includes motor or water carriers in addition to rail carriers, we can conclude with some confidence that a merger of two rail carriers would not cause a significant increase in market power, because truck and barge capital are sufficiently mobile that any attempt by rail carriers to raise prices or reduce service quality would result in a significant loss of rail market share and profit.¹¹ The same reasoning would apply if motor and/or water carriers could provide source competition at both the origin and the destination.

If a particular location/commodity pair market consists only of rail carriers, then the merger of two of these carriers will certainly result in some loss of competition. The degree to which competition is lost could conceivably depend on the market shares of the merging railroads, but I have seen no empirical test of this. What it seems more clearly to depend on is the number of rail carriers remaining in the market following the merger: Levin [1981a, b], Grimm [1985], and MacDonald [1987, 1989] all find significant increases in rail rates resulting from a move from three carriers to two, while Levin [1981a, b], Atkinson and Kerkvliet [1986], and MacDonald [1987, 1989] all find significant rate increases resulting from a move from two carriers to one. I have seen no empirical demonstration of a competitive loss resulting from a move from four carriers to three.

For this reason, I will focus in this paper on markets in which the proposed merger of the ATSF and SP would result in a reduction in the number of competitors from three to two or from two to one. Concluding from the empirical literature just cited that such a reduction constitutes a significant reduction in the strength of *intramodal* competition, I will then examine whether the markets in question include motor or water carriers or significant source competition at both origin and destination. In markets which do not include such factors, I conclude that the merger would be anticompetitive.

IV. TWO MEASUREMENT ISSUES

Two measurement issues need to be addressed before we proceed to a competitive analysis of the ATSF/SP merger. First, which rail firms are to be

¹⁰ Stigler [1964] argues from a model of collusion that "the incentive to cut prices ... increases rapidly with the number of sellers." Orr and MacAvoy [1965] reach a similar theoretical conclusion. The same theoretical result is shown in a noncollusive oligopoly setting by Waterson [1984] and in an auction setting by Froeb [1988]. Empirical support for this position in a variety of industry settings may be found in Weiss [1984, 1989], Brannman, *et al.* [1987], and Brown and Warren-Boulton [1988].

¹¹ See Baumol [1984], emphasizing motor carriers, MacDonald [1987], emphasizing water carriers, and MacDonald [1989], discussing both.

included in a particular market? Second, how large is the geographic area of an origin or destination included in a market?

It would be possible to investigate rail markets and include only those firms currently carrying a particular commodity between the particular origin-destination pair as “in the market.” However, if another railroad is currently carrying freight of any kind between the origin and destination in question, even if it is not carrying the commodity in question between the two locations, a reasonable (rebuttable) presumption would seem to be that that railroad could easily carry the commodity in question, therefore has an effect on rates, therefore belongs in the market. Once we make that presumption we can ask whether, for example, it is only a contract between the shipper and the first railroad that keeps the second railroad from participating at a particular time, or whether there is something about the configuration of the second railroad—perhaps a circular route or poorly-maintained track requiring low speeds or lack of direct service to certain plants—which hampers its ability to serve the particular shippers at issue. Thus in counting the number of railroads in a particular commodity/location market I include all railroads currently serving that origin-destination pair, regardless of whether they currently carry the particular commodity.¹²

The question of the geographic scope of origins and destinations does not yield an answer that can be applied uniformly for all products and locations. While many shippers have immediate access to two or more rail carriers at their plant or mine sites—through either direct service, trackage rights, or reciprocal switching arrangements—even those who do not may be able to substitute among rail carriers if they can move their product by truck to a rail carrier serving nearby points. The degree to which this is economically feasible depends upon the characteristics of the commodity—especially upon its value per ton—and upon the distance to the nearest alternative railroad, but the practice appears to be widespread.¹³ My judgment is that for nearly all commodities and locations, all railroads serving a particular county need to be included among the competitive options facing shippers, and that for most commodities and locations the net must be cast even wider, to groupings of counties such as the Commerce Department’s Business Economic Areas

¹²This methodological decision does not, in principle, bias the analysis either in favor of or against a merger, since the consequence is to include both nonmerging and merging railroads as potential competitors for shippers whom they do not currently serve. For example, while this rule would cause us to consider benign a market currently split 50/50 between the ATSF and SP but capable (by our definition) of being served by the UP, BN, and Kansas City Southern (KCS), it would also cause us to consider troublesome a market currently split 50/50 between the ATSF and UP but capable of being served by the SP.

¹³I have encountered instances of this practice in the following two-digit Standard Transportation Commodity Code industries: 01, farm products; 11, coal; 14, nonmetallic minerals; 20, food and kindred products; 24, lumber and wood products; 26, pulp, paper, and allied products; 28, chemicals and allied products; 32, clay, concrete, glass, and stone; 33, primary metal products; 34, fabricated metal products; 37, transportation equipment; and 40, waste and scrap materials.

(BEAs). In what follows I will use the BEA as the unit of origin and destination for all but the bulkiest of commodities; for the latter I will use counties.

V. COMPETITIVE ANALYSIS OF THE PROPOSED ATSF/SP MERGER

Let us consider all traffic moving on origin-destination pairs in which an ATSF/SP merger would reduce the number of railroad competitors from three to two or from two to one. According to the empirical evidence cited earlier, such a reduction could result in a significant increase in market power for the merged firm and significantly increased transport prices facing shippers, but, according to the theory outlined above, only for those location/commodity combinations in which the two or three remaining rail carriers constitute the market—in other words, only for those combinations for which intermodal competition and source competition are not important.

Tables A.I through A.XIII in the Appendix list the most important commodities and locations where the number of rail carriers would be reduced from three to two or from two to one. The source of the data is the 1985 sample waybill tape compiled by the ICC. (Considerations of both tractability and data confidentiality compel the geographic aggregation.) Here I address only a sample representing those commodities of the largest tonnages and illustrating the analytical principles involved.

Chemical products are represented here by products 28123, sodium compounds; 28125, potassium compounds; 28151, cyclic intermediates; 28181, acyclic organic chemicals; 28185, glycols and glycerines; 28211, plastic materials; and 28419, soaps. These are bulk products travelling over long distances, distances for the most part great enough that, with the exception of most of the within-California and within-Texas moves, motor carriers are not in the market.¹⁴ In all cases geography prevents water carriers from participating effectively. Source competition is of potential significance for bulk, mostly undifferentiated commodities such as these, but the railroad data and my shipper interviews revealed it only rarely to be a powerful factor at both origin and destination (though it is often a factor at one or the other). Thus for the majority of these commodities listed in the tables, it appears that the merged railroad would be able to raise its prices.

Containerized ("piggyback") traffic—45111, shipper association traffic, and 46111, all freight rate shipments—is a somewhat different matter. Motor carriers can compete effectively for this traffic over a much longer distance

¹⁴ See, for example, Oum [1979, p. 480]. The traffic manager of Dow Chemical told me that the maximum range of truck competitiveness for bulk chemical commodities such as these is 400–600 miles, and the president of the El Paso Products Company testified that “bulk motor carrier rates from Odessa to the West Coast [about 1000 miles] are approximately 200% higher than rail tank and hopper car rates.” See also the verified statement of Union Carbide.

than for commodities such as bulk chemicals, so that some of the table entries are removed from the list of moves of competitive concern—specifically, the within-California moves and some of the Los Angeles-Houston intra-corridor moves. However, the remainder of the tonnage is beyond the reach of regular motor carrier competition.¹⁵ We cannot analyze source competition with complete confidence for this traffic, since we do not know what the specific commodities in the containers *are*, but we do know that much containerized traffic is branded, which suggests that this factor is not critical. For most of the containerized traffic listed, then, it appears that the merged railroad would be able to raise its prices.

Fresh fruits and vegetables of importance here include 1195, potatoes; 1214, oranges; 1224, grapes; 1312, carrots; 1331, broccoli; 1334, celery; 1335, lettuce; and 1398, melons. These are relatively high-value, time-sensitive commodities for which motor carriers must be included in the market even for moves as long as 2000 miles (Oum [1979, p. 480]). This removes all but the longest moves of Table A.I from our list of matters of possible concern. The remainder—still over a hundred thousand tons—remain subject to railroad price increases, however, since source competition does not appear likely to mitigate the market power of the merged railroad.

Several *grains* appear likely to be affected by the merger, including 1131, barley; 1132, corn; 1136, sorghum; 1137, wheat; and 1144, soybeans. Since these commodities typically leave the farm by truck, truck is quite competitive with rail for short-distance moves; however, the evidence suggests strongly that beyond a certain distance—perhaps 250 miles, certainly no more than 500 miles—motor carriers cannot be included in the market.¹⁶ All of the within-Midwest and within-California tonnage is removed from concern by the likelihood of this intermodal competition. Source competition offers some protection to shippers or receivers of some of these movements but almost never to both shippers and receivers, and hence it is rarely effective in preventing the exercise of railroad market power.

A fifth group of commodities of importance consists of *automobile products*—37111, motor passenger cars; 37112, motor trucks; and 37149, motor vehicle accessories and parts. These are high-value, branded manu-

¹⁵ See the verified statements of the California Grape and Tree Fruit League, Hapag-Lloyd Agencies, and LACNY Freight Forwarders, and the Post-Hearing Brief of the US Department of Justice, p. 29, fn. 28.

¹⁶ See, for example, Sorenson [1983], Adam and Anderson [1985], Baumel, *et al.* [1987], and the “Distance Travelled” data in the annual *Kansas Grain Marketing* reports. The president of Agrex, Inc., testified that bulk grains are typically shipped only “up to 150 miles” by motor carrier. Supporting evidence is contained in the verified statements of the Farmers Co-op Elevator Company, Atchison County Farmers Union Cooperative Association, the Colorado Wheat Administrative Committee, Cooperative Producers, Farmers’ Elevator Company, Lexington Mill and Elevator Company, Marty Mason and Associates, and Mathis Grain and Elevator Corporation.

factured commodities for which motor carriers can compete with rail for distances of perhaps one thousand miles, but not for distances significantly greater than that.¹⁷ Thus some of the Los Angeles-Houston intra-corridor moves are probably protected from supercompetitive rail prices, as are some of the Midwest-Gulf Coast moves. The same cannot be said, however, of the California-Midwest and Los Angeles-Houston and beyond traffic, most of which must move distances exceeding two thousand miles. Similarly, the strongly branded nature of these commodities renders source competition ineffectual in protecting shippers from rail price increases.

Finally, consider the *lumber products* represented in the tables—24114, pulpwood logs; 24115, pulpwood chips; 24211, lumber; 24321, plywood; and 24996, wood particle board. These divide neatly into two groups. Pulpwood logs and chips are low-value commodities for which intermodal competition is effective only for the shortest of distances; this factor can remove from our list of concern some but not all of the within-Midwest and within-Texas moves listed here. The other lumber products are higher-value manufactured commodities for which intermodal competition can be effective over moderate distances, but not long enough to eliminate these moves from the list of problem moves.¹⁸ Source competition does not appear to be important for these moves.

Using analyses such as these for the commodity movements shown in the tables and rougher estimates for movements of lesser tonnages in the same geographic corridors, I estimate that an ATSF/SP merger would cause a significant loss of competition for 35.3 million tons of traffic. The average revenue to the railroads from this traffic—to all the railroads participating in the traffic, not just the ATSF and SP—is \$63.64 per ton, yielding an estimate of \$2.24 billion of commerce adversely affected by the merger.

Using Figure 1, we may divide the aggregate effect of the merger into four parts:

- (1) triangle A, the loss to shippers from an increase in price,
- (2) triangle B, the loss to the railroads from a reduction in tonnage that was earning more than marginal cost,
- (3) rectangle C, the transfer from shippers to the railroads, and
- (4) rectangle D, the gain to the railroads from a reduction in operating costs.

Areas A and B represent unambiguous welfare losses to society. Area C may not represent such a welfare loss if it is merely a transfer; however, to the extent that the transfer results in increased rent-seeking or the loss of competition results in *X*-inefficiency, then some or all (or conceivably more

¹⁷ See the verified statements of the Chrysler Corporation, the General Motors Corporation, and Volkswagen of America, and Pittman [1985, p. 40, fn. 31].

¹⁸ See the verified statements of Cowlitz Stud Company, Grays Harbor Hardwood, and Valley Lumber Sales, and Pittman [1985, p. 35, fn. 24]. Note that based upon these statements, Oum's [1979] conclusion that for lumber products there is "no significant intermodal competition even in short-haul markets" goes too far.

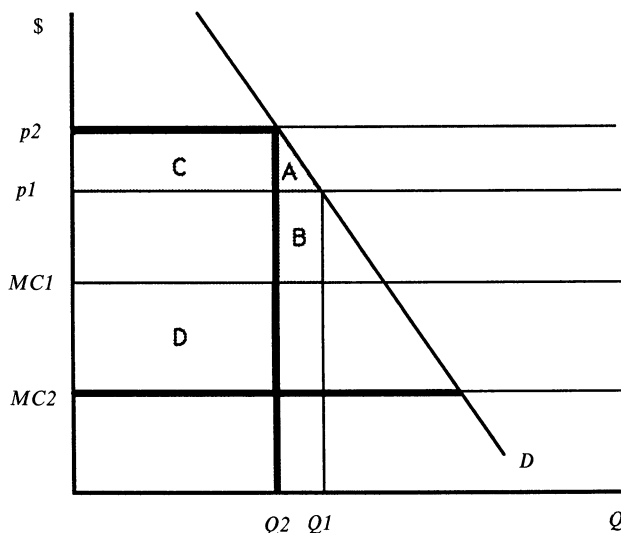


Figure 1
Competitive Consequences of the Merger

than all) of area C represents a welfare loss to society as well.¹⁹ Area D represents an unambiguous welfare gain to society.

We can estimate a range for the size of these areas by making the following assumptions:

- (1) the merger would result in an average price increase by the railroads for the affected traffic in the range of 15 percent (MacAvoy [1989], MacDonald [1987, 1989]) to 30 percent (Atkinson and Kerkvliet [1986]);²⁰

¹⁹ The classic reference for rent-seeking is Posner [1975]; see also Tullock [1980] and Tirole [1988]. The classic reference for *X*-inefficiency is Leibenstein [1966]. An example of the type of rent-seeking and rent-dissipation which might follow an anticompetitive rate increase is the multi-year, multi-tribunal dispute between the Omaha Public Power District and the Burlington Northern Railroad over coal tariffs (ICC No. 38783). See, for example, the Administrative Law Judge decision of January, 1986, the initial ICC decision of November, 1986, and the ICC decision (in response to an appeal) of May, 1987. For an example of rent-seeking brought about by an anticompetitive merger, one need look no further than the multitude of conditions to merger approval sought by competing and connecting railroads in the ATSF/SP proceeding.

²⁰ There is no dispute that the merged railroad planned to raise some of its prices. In an interview with the *Journal of Commerce* published on the morning of the scheduled ICC vote on the merger proposal, ATSF president John Swartz "zeroed in on pricing as a major post-merger concern. 'We've got to have pricing discipline,' he said. ... 'Some business is so unprofitable ... we will have to raise our prices.'" Although he did not specify all of the "business" to which he was referring, two areas mentioned which are relevant to the discussion above are "intermodal [i.e. piggyback] business" and "eastbound perishables."

TABLE I
 COSTS AND BENEFITS OF THE PROPOSED MERGER IF PRICES OF AFFECTED TRAFFIC INCREASE BY 15 PERCENT

	<i>Annual Operating Savings</i> \$110 Million	<i>Annual Operating Savings</i> \$220 Million
<i>Elasticity of Demand</i> -0.5	Direct Welfare Loss = \$42.8 million Transfer from Shippers = \$255.7 million	Direct Welfare Loss = \$31.1 million Transfer from Shippers = \$198.3 million
<i>Elasticity of Demand</i> -1.0	Direct Welfare Loss = \$85.6 million Transfer from Shippers = \$239.2 million	Direct Welfare Loss = \$62.2 million Transfer from Shippers = \$188.7 million

- (2) the average pre-merger ratio of price to marginal cost for this traffic is 1.34 (the average revenue-to-variable-cost ratio for US railroads calculated by the ICC from its 1986 waybill statistics);
- (3) the own-elasticity of demand facing the railroads is in the range of -0.5 (Friedlaender and Spady [1981]) to -1.0 (MacAvoy [1984]; Wilson, *et al.* [1988]); and
- (4) the merger would result in a reduction in operating costs for the railroads in the range of 2.5 percent to 5 percent.²¹

Two points should be made immediately concerning these assumptions. The first is that the assumed price effects are a bit conservative given the other assumptions. In a Cournot model with equal-sized firms, a constant elasticity of demand, and an initial price-to-marginal-cost ratio of 1.34, a merger of duopoly firms which results in a marginal cost reduction of 5 percent (2.5 percent) increases the profit-maximizing output price by 42 percent (46 percent). Correspondingly, a merger of two of three firms which results in a marginal cost reduction of 5 percent (2.5 percent) increases the profit-maximizing output price by 13 percent (16 percent)—and this does *not* include the possibility that a movement from three to two firms changes the nature of firm interaction from Cournot to collusion.²²

The second point is that, as a referee points out, the assumptions

²¹ The merging railroads testified that the result of the transaction would be a savings of operating expenses of \$220 million, or about 5 percent per year (MacAvoy [1984]). This is clearly an upper-bound estimate, not only because the firms have every incentive to inflate it but also because there was no serious attempt made to subtract those savings that could be obtained through means less anticompetitive than merger. (See, for example, the Merger Guidelines at 3.5, or Fisher [1987, pp. 503–506].) It is clear upon close examination that many of the savings could be so obtained (Harris [1985]; Pittman [1988]). The parties also forecast one-time savings of \$522.4 million in avoided capital expenditures, but this was an undiscounted stream of savings occurring over many years. For example, only a total of \$126.8 million would be avoided in the first three years following the merger.

²² See, for example, Farrell and Shapiro [forthcoming].

TABLE II
 COSTS AND BENEFITS OF THE PROPOSED MERGER IF PRICES OF AFFECTED TRAFFIC INCREASE BY 30 PERCENT

	Annual Operating Savings \$110 Million	Annual Operating Savings \$220 Million
<i>Elasticity of Demand</i> -0.5	Direct Welfare Loss = \$116.4 million Transfer from Shippers = \$520.8 million	Direct Welfare Loss = \$98.0 million Transfer from Shippers = \$466.4 million
<i>Elasticity of Demand</i> -1.0	Direct Welfare Loss = \$232.8 million Transfer from Shippers = \$440.1 million	Direct Welfare Loss = \$195.9 million Transfer from Shippers = \$403.7 million

concerning cost reductions are especially generous. First, not all changes in what railroad people call operating costs are changes in what economists call marginal costs. Second, I have assumed that the marginal cost curve is flat. If there is any decline in the marginal cost curve in the relevant range of demand—due to economies of scale or density—the reduction in output caused by the loss of competition will prevent the forecasted cost savings from being achieved. This effect is compounded by the fact that the level of marginal cost affects the level of price chosen.

Tables I and II show the results of calculations utilizing these assumptions.²³ Two points stand out. The first is the importance of choosing the correct value for both the annual operating savings and the elasticity of demand.²⁴ I believe that the case record supports more strongly the smaller estimate of operating savings, but there is almost no discussion of the elasticity value (which of course varies by product and location). The second point shown clearly by the table is the importance of the treatment of transfers. If transfers from shippers to the railroads are treated as a direct welfare loss—either because through rent-seeking and *X*-inefficiency they are likely to become traditional welfare losses or because transfers resulting from mergers are negatively valued *per se*—then the merger is socially harmful under any reasonable estimates of efficiencies and the other relevant

²³ As an example of the calculations, consider the southeast quadrant of Table I. $P_1 = \$63.64$, so $MC_1 = \$63.64/1.34 = \47.49 . Then $MC_2 = (0.95) (\$47.49) = \45.12 , and $P_2 = (\$45.12) (1.34) (1.15) = \69.53 . If $(\partial Q/\partial P)/(Q/P) = -1$ and $Q_1 = 35.3$ million, then $Q_2 = 32.04$ million. It follows that $A = (0.5) (\$5.89) (3.26 \text{ million}) = \9.6 million; $B = (\$63.64 - 47.49) (3.26 \text{ million}) = \52.64 million; and $C = (\$5.89) (32.04 \text{ million}) = \188.72 million. The size of D is not important, since the total savings—spread across both traffic competitively harmed and traffic not competitively harmed by the merger—is set by assumption.

²⁴ Indeed, it could be argued that the wide range of uncertainty concerning an estimate of cost savings here is evidence for the position of Bork [1978] and others that efficiencies should not be considered in individual merger cases but rather should be factored into the concentration levels in the Merger Guidelines. See also Lande [1988].

variables. If transfers are treated as welfare-neutral, then the merger is socially beneficial with the higher estimate of efficiency gains, or even with the lower estimate if the lower estimate of price increases is accepted as well.

However, if one accepts the smaller estimate of operating savings, and if one is willing to place a non-negligible value on transfers, the merger becomes straightforward to evaluate. So long as one assumes that at least 26 percent of the wealth transfer is translated into a welfare loss, the merger is on net harmful to society.

Finally, consider a shift from normative to positive analysis. It is beyond the scope of this paper to engage in a sophisticated examination of the decision-making process at the ICC. Still it is interesting to note that this merger proposal may serve as one observation in testing the relative importance of two hypotheses which appear frequently in the literature of the economic theory of regulation:

- (1) Regulators are at least as concerned about the effects of transfers as about deadweight losses.
- (2) Regulators tend to favor small, organized groups at the expense of large, unorganized groups.²⁵

The ICC decision reports an estimate of annual operating savings resulting from the merger at \$188.2 million—4.3 percent of total operating costs. If we accept this as the Commission's true estimate and choose midpoint estimates for the other parameters of interest—an elasticity of demand of -0.75 and a price increase on affected traffic of 22.5 percent—we arrive at an evaluation of the proposed merger as causing gross deadweight losses of \$98.6 million and transfers from shippers to railroads of \$336.9 million. Under these assumptions, the ICC turned down a merger which promised efficiencies nearly twice the magnitude of gross deadweight losses. Why? Arguably because the magnitude of the *sum* of gross deadweight losses and transfers was more than twice the promised level of efficiencies. Thus whether the ICC believed that transfers are transformed into deadweight losses or that transfers are transformed into political losses, it appears that the volume of transfers was sufficient to overcome the small numbers effect (hypothesis (2) above) and defeat the merger.

VI. CONCLUSION

In this paper I have described how the Merger Guidelines may be applied to a merger in the railroad industry and have used the Guidelines to evaluate the proposed merger of the Santa Fe and Southern Pacific railroads. Although simple conclusions are difficult to reach in a merger of this complexity, I have shown that under reasonable assumptions concerning the likely operating efficiencies resulting from the merger, the merger is likely to be harmful to

²⁵ See, in general, Stigler [1971] and Peltzman [1976].

society, particularly if one places modest, though significant negative value on transfers from shippers to the merging railroads.

What the analysis also demonstrates is the critical importance of three factors in evaluating the impact of a merger such as this one: a careful, location- and commodity-specific analysis of the loci of likely competitive harm, an unbiased estimate of those operating savings promised by the merger which could not be obtained through means less anticompetitive, and a careful judgment as to the importance (or lack thereof) of transfers in the calculation of welfare losses.

RUSSELL W. PITTMAN,
Regulatory Economics Section,
Antitrust Division,
US Department of Justice,
555 4th Street, NW, Room 11-439,
Washington, DC 20001,
USA.

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APPENDIX

TABLE A.I
 LOCATION = CALIFORNIA—MIDWEST; DIRECTION = EAST

<i>STCCS</i>	<i>PRODUCT</i>	<i>TONS</i>
46111	All Freight Rate Shipments	1 351 641
45111	Shipper Association Traffic	706 321
1335	Lettuce	363 336
20841	Wine, Brandy or Brandy Spirits	311 948
20995	Mixed Loads of Food	251 252
20621	Sugar, Granulated or Powdered	220 948
37111	Motor Passenger Cars, Assembled	213 460
1214	Oranges	186 192
28123	Sodium Compounds	139 120
20336	Catsup or Other Tomato Sauces	113 636
1224	Grapes	102 030
33511	Copper, Brass or Bronze	100 860
1398	Cantaloupes, Melons or Muskmelons	100 758
28125	Potassium Compounds	96 532
20391	Mixed Loads of Canned Food	84 760
1195	Potatoes, Other than Sweet	83 332
1334	Celery	78 848
1331	Broccoli	64 320
20373	Frozen Vegetables	64 212
1312	Carrots	63 316
20933	Nut or Vegetable Oils	54 660

TABLE A.II
LOCATION = CALIFORNIA—MIDWEST; DIRECTION = WEST

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
46111	All Freight Rate Shipments	1 560 400
45111	Shipper Association Traffic	1 196 392
1136	Sorghum Grains	727 448
37111	Motor Passenger Cars, Assembled	712 936
20461	Corn Syrup	509 920
20821	Beer, Ale, Porter, Stout	432 480
37112	Motor Trucks, Assembled	267 400
37149	Motor Vehicle Accessories or Parts	197 529
1137	Wheat	188 380
20923	Soybean Cake, Flour, Grits, Meal	163 696
44111	Freight Forwarder Traffic	162 680
1132	Corn	152 910
28211	Plastic Materials or Synthetic Resins	138 760
20921	Soybean Oil, Crude or Refined	132 576
20421	Prepared Feed, Animal, Fish or Poultry	112 800
1131	Barley	110 920
11212	Prepared Bituminous Coal	107 620
40241	Paper Waste or Scrap	101 840
33127	Tin Mill Products	99 680
20141	Hides, Pelts or Skins	87 480
42211	Trailers, Semi-Trailers, or Containers	79 255
43111	Mail	77 120
20411	Wheat Flour	75 920
28441	Cosmetics, Perfumes	61 468
33123	Iron or Steel Sheet or Strip	60 644
28419	Soap or Other Detergents	54 440

TABLE A.III
LOCATION = LA—HOUSTON, INTRA-CORRIDOR; DIRECTION = EAST

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
28125	Potassium Compounds	1 069 404
46111	All Freight Rate Shipments	490 540
32411	Hydraulic Cement	367 604
29116	Asphalt Pitches	291 000
20821	Beer, Ale, Porter, Stout	210 920
24211	Lumber, Rough or Dressed	121 040
28123	Sodium Compounds	109 400
37111	Motor Passenger Cars, Assembled	97 040
45111	Shipper Association Traffic	89 888
20841	Wine, Brandy or Brandy Spirits	62 240
10212	Copper Concentrates or Precipitates	50 484

TABLE A.IV
LOCATION = LA—HOUSTON, INTRA-CORRIDOR; DIRECTION = WEST

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
1137	Wheat	268 752
1136	Sorghum Grains	230 112
32411	Hydraulic Cement	155 168
1129	Raw Cotton, NEC	147 064
26311	Fiberboard, Paperboard or Pulpboard	129 120
26211	Newsprint	112 560
28211	Plastic Materials or Synthetic Resins	109 200
1132	Corn	95 488
46111	All Freight Rate Shipments	93 232
26111	Pulp	78 520
20461	Corn Syrup	66 120
20141	Hides, Pelts or Skins	63 920
32741	Lime or Lime Plaster	52 452
45111	Shipper Association Traffic	50 092

TABLE A.V
LOCATION = LA—HOUSTON, AND BEYOND; DIRECTION = EAST

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
46111	All Freight Rate Shipments	1 340 570
1129	Raw Cotton, NEC	258 100
20841	Wine, Brandy or Brandy Spirits	150 648
45111	Shipper Association Traffic	112 332
37111	Motor Passenger Cars, Assembled	107 584
20995	Mixed Loads of Food	84 000
28123	Sodium Compounds	73 192
37149	Motor Vehicle Accessories or Parts	52 400

TABLE A.VI
LOCATION = LA—HOUSTON, AND BEYOND; DIRECTION = WEST

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
46111	All Freight Rate Shipments	1 152 792
28211	Plastic Materials or Synthetic Resins	573 316
26311	Fiberboard, Paperboard or Pulpboard	167 780
45111	Shipper Association Traffic	133 644
28185	Glycols or Glycerines	128 400
24321	Plywood or Veneer	100 200
29117	Petroleum Residual Fuel Oils	99 080
37112	Motor Trucks, Assembled	94 600
33124	Iron or Steel Bars	74 600
32952	Light Weight Aggregates	72 720
28151	Cyclic Intermediates from Benzene	67 880
29114	Petroleum Lubricating or Similar Oils	63 800
28181	Miscellaneous Acyclic Organic Chemicals	60 520
41117	Military Impedimenta	56 008
29119	Petroleum Refining Products, NEC	51 348

TABLE A.VII
LOCATION = MIDWEST—GULF COAST; DIRECTION = NORTH

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
28211	Plastic Materials or Synthetic Resins	111 360
33511	Copper, Brass or Bronze	100 060
26311	Fiberboard, Paperboard or Pulpboard	70 060
1137	Wheat	59 716
32959	Nonmetallic Minerals or Earths, Ground	58 480

TABLE A.VIII
LOCATION = MIDWEST—GULF COAST; DIRECTION = SOUTH

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
1137	Wheat	370 546
1132	Corn	223 726
20411	Wheat Flour	219 648
1144	Soybeans (Soya Beans)	131 676
20461	Corn Syrup	117 000
29913	Petroleum Coke	107 800
14413	Industrial Sand	88 440
37111	Motor Passenger Cars, Assembled	71 480
20143	Grease or Inedible Tallow	60 880

TABLE A.IX
LOCATION = PACIFIC NW—CALIFORNIA, ARIZONA; DIRECTION = NORTH

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
46111	All Freight Rate Shipments	66 600

TABLE A.X
LOCATION = PACIFIC NW—CALIFORNIA, ARIZONA; DIRECTION = SOUTH

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
24211	Lumber, Rough or Dressed	2 054 160
26311	Fiberboard, Paperboard or Pulpboard	699 120
24321	Plywood or Veneer	558 240
26211	Newsprint	518 680
24996	Wood Particle Board	404 280
26213	Printing paper, Coated or Uncoated	197 880
33124	Iron or Steel Bars	127 040
26214	Wrapping Paper	85 680
20831	Malt	77 080

TABLE A.XI
LOCATION = WITHIN CALIFORNIA

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
1197	Sugar Beets	641 400
32411	Hydraulic Cement	562 094
28123	Sodium Compounds	412 212
26311	Fiberboard, Paperboard or Pulpboard	200 440
32752	Gypsum Plaster	175 444
46111	All Freight Rate Shipments	134 268
1137	Wheat	120 980
24115	Pulpwood or Other Wood Chips	78 240
20841	Wine, Brandy or Brandy Spirits	64 360
40211	Iron or Steel Scrap	55 040
20821	Beer, Ale, Porter, Stout	53 680
20441	Rice, Cleaned	53 560
24211	Lumber, Rough or Dressed	51 440

TABLE A.XII
LOCATION = WITHIN MIDWEST

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
1137	Wheat	748 628
1136	Sorghum Grains	274 694
40211	Iron or Steel Scrap	70 380

TABLE A.XIII
LOCATION = WITHIN TEXAS

<i>STCC5</i>	<i>PRODUCT</i>	<i>TONS</i>
1137	Wheat	343 216
28211	Plastic Materials or Synthetic Resins	278 800
24114	Pulpwood Logs	149 780
40211	Iron or Steel Scrap	147 280
24115	Pulpwood or Other Wood Chips	107 080
29913	Petroleum Coke	76 640

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